

ABSTRACT OF THE DISCLOSURE

An integrated actuator for an optical switch mirror array, which uses a novel integrated actuation technique combining electrostatic or electromagnetic (or both) actuation in combination with air (or any other gas) blast actuation. This combined approach provides integrated actuation, by use of an air (or any gas) blast to move the mirror to a tilt position, and with the application of the proper voltage, to have the pull-in effect take over and move the mirror to its final position. The pull-in effect can be achieved also by a magnetic field. The integrated design provides advantages because the mechanical moment provided by a relatively small air (gas or fluid) blast is significantly larger than the moment available from electrostatic or electro-magnetic actuation at reasonable field strength levels. Thus, the required pull-in voltage can be reduced significantly while allowing manufacture of the mirror structure using superior manufacturing materials employing thicker, crystalline silicon, as opposed to a thin polysilicon layer. This increases reliability and rigidity, and the air (any gas or any fluid) blast will be sufficient to overcome the rigidity to make the mirror motion possible at the right time.